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EXAMINER	
SENFI, BEHROOZ M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/716,038	SASAI ET AL.	
	Examiner	Art Unit	
	BEHROOZ SENFI	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 February 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3,5,13-17,22-27,33,36,38,40,43,45 and 47-52 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3,5,13-17,22-27,33,36,38,40,43,45 and 47-52 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 – 3, 5, 22 – 27, 33, 38, 40, 45 and 47 - 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharma et al. (US 6,192,079) in view of Demos (US 2004/0005004).

Regarding claim 1, Sharma '079 discloses, an interpolation frame generation device for generating an interpolation frame (please see; fig. 1, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma) for interpolating image frames that are obtained by decoding a coded image signal (e.g. as illustrated in figs. 1 and 6 of Sharma, cols. 3 - 4, lines 66 – 22 and col. 5, lines 45 – 48; receiver 19, including frame rate up-sampler "FRU 20" integral with decoder "e.g. col. 4, lines 9" decodes the received coded image signal "e.g. fig. 1, receiver 19, receives the coded image signal from encoder/sender 8 through communication channel 10" for interpolating the image frames by decoding the coded image signal, of Sharma) that is coded by motion compensation (please see; abstract, lines 9 – 13, col. 5, lines 25 – 27 and lines 35 – 37, indicating motion compensation taking place in encoder side to generate motion vector "MV" and transmits the motion

vectors as part of the video bit-stream/signal to be used to generate interpolated frames of Sharma), the device comprising;

a motion compensation vector acquisition unit operable to acquire a motion compensation vector of a coded block that forms the coded image signal by decoding the coded image signal (please see; fig. 1, receiver 19, thus acquire a motion compensation vector of the coded block generated in encoding side to form the coded image signal and transmits to the decoder to decode the coded image signal as part of the video bit-stream and being used to generate interpolated frames, as discussed in col. 5, lines 21 – 37 and 45 – 48 of Sharma); and

an interpolation frame generation unit operable to generate the interpolation frame (please see; fig. 1, frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma) in accordance with at least a motion vector of an image block (e.g. col. 5, lines 45 – 48, indicating the use of motion vector "MV" of the image to generate the interpolated frames, also see fig. 3, using MV for interpolation of the frame) that forms an image frame by using the motion compensation vector of the coded block as the motion vector of the image block (please see; abstract, lines 9 – 13, col. 5, lines 25 – 27 and lines 35 – 37, indicating motion compensation taking place in encoder side to generate motion vector "MV" and the receiver "e.g. frame rate up-sampler (FRU 20) integral with decoder, as discussed earlier in the above action" uses the received motion compensation vector of the coded block as the motion vector of the image block to generate the interpolated frames, as illustrated in fig. 6, col. 4, lines 16 - 19 and col. 5,

lines 45 – 48 of Sharma), wherein the interpolation frame generation unit is operable to generate the interpolation frame for an image block, based upon a motion vector detected by using an image frame (please see; fig. 1, frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" col. 4, lines 16 - 19 and col. 5, lines 30 – 48, and 62 - 65 of Sharma).

Sharma is silent in regards to explicit of, that is not included in one image frame located sequentially after the interpolation frame in a display order, image frame that is located temporally further from the interpolation frame than the one image frame).

Demos '004 in the same field of interpolation (i.e., figs. 5 and 12, page 2, paragraph 0025 and page 11, paragraph 0163) teaches, interpolation frame for an image block using image frame that is located further away from the interpolation frame than the one image frame.

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the video frame interpolation in video decoding process of Sharma, in accordance with the teaching of Demos, to improve the interpolation of video compression/decompression frames, as suggested by Demos (i.e., page 1, paragraph 0002).

Regarding claim 2, Sharma teaches, an interpolation frame generation device for generating an interpolation frame (please see; fig. 1, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma) for interpolating image frames that are obtained by decoding a coded image

signal (e.g. as illustrated in figs. 1 and 6 of Sharma, cols. 3 - 4, lines 66 – 22 and col. 5, lines 45 – 48; receiver 19, including frame rate up-sampler "FRU 20" integral with decoder "e.g. col. 4, lines 9" decodes the received coded image signal "e.g. fig. 1, receiver 19, receives the coded image signal from encoder/sender 8 through communication channel 10" for interpolating the image frames by decoding the coded image signal, of Sharma) that is coded by motion compensation (please see; abstract, lines 9 – 13, col. 5, lines 25 – 27 and lines 35 – 37, indicating motion compensation taking place in encoder side to generate motion vector "MV" and transmits the motion vectors as part of the video bit-stream/signal to be used to generate interpolated frames of Sharma), the device comprising; a motion compensation vector acquisition unit operable to acquire a motion compensation vectors of coded blocks that forms the coded image signal by decoding the coded image signal (please see; fig. 1, receiver 19, thus acquire a motion compensation vector of the coded block generated in encoding side to form the coded image signal and transmits to the decoder to decode the coded image signal as part of the video bit-stream and being used to generate interpolated frames, as discussed in col. 5, lines 21 – 37 and 45 – 48 of Sharma); and a motion vector detection unit operable to detect at least a motion vector between a base frame and a reference frame (please see; figs. 3 – 5, col. 5, lines 33 – 48, detection of motion vector between two frames, current frame e.g., base frame and another, e.g., reference frame) and operable to detect the motion vector of an image block forming the base frame in an area of the reference frame that is determined in accordance with the motion compensation vector (please see; figs. 2 - 5 col. 5, lines 33 – 48, indicating motion estimation, detecting motion vector of the image block "e.g., block-based motion

estimation" which is performed on a per block basis in the current frame "e.g., base frame" with the matching block in the previous frame "e.g., reference frame" for motion compensated coding "e.g. motion compensation vector" of Sharma); and an interpolation frame generation unit operable to generate the interpolation frame in accordance with the detected motion vector (please see; fig. 1, receiver 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" in accordance with the detected motion vector transmitted as part of the video signal, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma), wherein the interpolation frame generation unit is operable to generate the interpolation frame for an image block, based upon a motion vector detected by using an image frame (please see; fig. 1, frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" col. 4, lines 16 - 19 and col. 5, lines 30 – 48, and 62 - 65 of Sharma).

Sharma is silent in regards to explicit of, that is not included in one image frame located sequentially after the interpolation frame in a display order, image frame that is located temporally further from the interpolation frame than the one image frame).

Demos '004 in the same field of interpolation (i.e., figs. 5 and 12, page 2, paragraph 0025 and page 11, paragraph 0163) teaches, interpolation frame for an image block using image frame that is located further away from the interpolation frame than the one image frame.

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the video frame interpolation in

video decoding process of Sharma, in accordance with the teaching of Demos, to improve the interpolation of video compression/decompression frames, as suggested by Demos (i.e., page 1, paragraph 0002).

Regarding claim 3, the limitations claimed are substantially similar to claim 2 above; therefore the ground for rejecting claim 2 also applies here. For the additional limitation, an image signal information acquisition unit operable to acquire image signal information of the coded image signal, please see (fig. 1, receiver 19 "e.g. image signal information acquisition unit" to acquire/receive image signal information of the coded image signal from the sender/encoder side "e.g. sender/encoder unit 8 of fig. 1" through communication channel 10 of Sharma).

Regarding claim 5, Sharma '079 discloses, the interpolation frame generation device receiving the transmitted image signal from the sender/encoder side and generating interpolation frame, and detection of motion vector of partially selected image block, as discussed with respect to claim 3 above (please see; fig. 1, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6, thus receives the transmitted image signal from the sender/encoder side and generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48, and figs. 3 – 5, col. 5, lines 33 – 48, motion estimation and motion compensation for detecting motion vector on a per block basis "e.g. per block basis; consider as partially select image block among the entire image blocks, since each block is being selected for processing of motion vector detection" for detection of motion vector, of Sharma).

Sharma '079 is silent in regards to explicit of, coding mode and intra block.

Demos in the same field teaches (i.e., pages 1 - 2, paragraphs 0005, 0007 and 0017 and page 4, paragraph 0045) teaches the above subject matter.

Since both references teaches image/frame decoding and interpolation, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the video frame interpolation in video decoding process of Sharma, in accordance with the teaching of Demos, to improve the interpolation of video compression/decompression frames, as suggested by Demos (i.e., page 1, paragraph 0002).

Regarding claim 22, the limitations claimed have been analyzed and rejected with respect to claim 1 above.

Regarding claim 23, the combination of Sharma '079 and Demos '004 teaches, the interpolation frame generation device (please see; figs. 1 - 3 of Sharma, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma), wherein the plurality of first image frames are located on one side of the interpolation frame in the display order (please see; figs. 5 and 20 - 22, page 2, paragraphs 0025, 0030, page 4, paragraph 0051 and page 8, paragraphs 0120 – 0122, indicating the use of plurality of image frames as a reference frames that are located on one side of the interpolation frame in the display order of Demos) and includes a plurality of base frames that serve as bases for detecting the motion vectors (please see; figs. 5 and 20 – 22, page 3, paragraphs 0033 - 0034, page 5, paragraphs 0067 – 0068 and page 8, paragraph 0120, indicating plurality of frames "e.g. base frames" that serves as bases for motion vectors detection of Demos);

one or a plurality of second image frames are located on another side of the interpolation frame in the display order (please see; figs. 2 – 3 of Sharma, illustrating the second image frame “e.g. current frame” located on another side of the interpolation frame in the display order “e.g. previous frame and current frame order” of Sharma; also fig. 21 of Demos, illustrating second image frames located on another side of the interpolation frame “e.g. frames P1, P2 and/or P4, P5 located on different side of the interpolated frame B”, page 2, paragraph 0030, page 3, paragraph 0031 and page 14, paragraph 0197 of Demos) and include a reference frame that serves as an object for detecting the motion vectors (please see; figs. 2 – 3 of Sharma, illustrating the reference frame “e.g., previous frame” that serves as an object for detecting the motion vector of Sharma, also figs. 5 and 20 – 22 of Demos, page 3, paragraphs 0033 - 0034, page 5, paragraphs 0067 – 0068 and page 8, paragraph 0120, indicating “e.g., base frames” that serves as reference frame for motion vectors detection of Demos); and the motion vector detection unit is operable to detect the motion vectors between the base frame and the reference frame (please see; figs. 3 – 5, col. 5, lines 33 – 48, detection of motion vector between two frames, current frame (e.g., base frame) and previous frame (e.g., reference frame) of Sharma, also figs. 12 – 18 and 21, page 1, paragraph 0009 of Demos, indicating methods of motion vector detection/prediction).

Regarding claim 24, the combination of Sharma ‘079 and Demos ‘004 teaches, the interpolation frame generation device (please see; figs. 1 – 3 of Sharma, device 19 including frame rate up-sampler (FRU 20) integral with decoder “e.g. col. 4, lines 9” as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and

col. 5, lines 45 – 48 of Sharma), wherein the plurality of first image frames are located on one side of the interpolation frame in the display order (please see; figs. 5 and 20 - 22, page 2, paragraphs 0025, 0030, page 4, paragraph 0051 and page 8, paragraphs 0120 – 0122, indicating the use of plurality of image frames as a reference frames that are located before or after the interpolation frame in the display order, i.e., noted in Figs. 5 and 21, that the plurality of "P" frames are located before or after the interpolated "B" frame; see paragraphs 0005 and 0028 of Demos) and includes a plurality of reference frames that serve as reference for detecting the motion vectors (please see; figs. 5 and 20 – 22, page 3, paragraphs 0033 - 0034, page 5, paragraphs 0067 – 0068 and page 8, paragraph 0120, indicating plurality of frames as a reference frames that are located before or after the interpolation frame in the display order, i.e., noted in Figs. 5 and 21, that the plurality of "P" frames are located before or after the interpolated "B" frame; see paragraphs 0005 and 0028 that serves as bases for motion vectors detection of Demos); one or a plurality of second image frames are located on another side of the interpolation frame in the display order (please see; figs. 2 – 3 of Sharma, illustrating the second image frame "e.g. current frame" located on another side of the interpolation frame in the display order "e.g. previous frame and current frame order" of Sharma; also fig. 21 of Demos, illustrating second image frames located on another side of the interpolation frame "e.g., frames P1, P2 and/or P4, P5 located on different side of the interpolated frame B", page 2, paragraphs 0028, 0030, page 3, paragraph 0031 and page 14, paragraph 0197 of Demos) and include a base frame that serves as an object for detecting the motion vectors (please see; figs. 5 and 21 – 22, page 2, paragraphs 0028, page 3, paragraphs 0033 - 0034, page 5, paragraphs 0067 – 0068 and page 8,

paragraph 0120, indicating plurality of frames (e.g., base frames) that serves as base for motion vectors detection of Demos); and the motion vector detection unit is operable to detect the motion vectors between the base frame and the reference frame (please see; figs. 3 – 5, col. 5, lines 33 – 48, detection of motion vector between two frames, current frame (e.g., base frame) and previous frame (e.g., reference frame) of Sharma, also figs. 12 – 18 and 21, page 1, paragraph 0009 of Demos, indicating methods of motion vector detection/prediction).

Regarding claims 25 and 27, the limitations claimed are substantially similar to claim 23 above, thus have been analyzed and rejected with respect to combination teaching of Sharma '079 and Demos '004.

Regarding claim 26, Sharma '079 discloses, the interpolation frame generation device (please see; figs. 1 – 3 of Sharma, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma), wherein the motion vector detection unit is operable to detect a first motion vector between a first base frame that serves as a base for detecting the first motion vector and a first reference frame that is located before the first base frame in the display order (please see; figs. 3 – 5, col. 5, lines 33 – 48, detection of motion vector "e.g. first motion vector" between two frames, current frame (e.g., base frame) and previous frame (e.g., reference frame), which is located before the base/current frames of Sharma).

Sharma '079 is silent in regards to explicit of, detects a second motion vector between a second base frame that serves as a base for detecting the second motion

vector and a second reference frame that is located after the second base frame in the display order.

Demos '004 in the same field teaches detection of motion vectors (please see; fig. 22, illustrates detection of MV's between a second base frame (i.e., frame P5 consider as second base frame) and a second reference frame (i.e., subsequent P frame, P4) which is located after the second base frame "e.g. P5" in the display order, page 14, paragraph 0198 of Demos).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to improve the video frame interpolation process of Sharma in accordance with the teaching of Demos, by detecting a second motion vector between a second base frame "P5" that serves as a base for detecting the second motion vector and a second reference frame that is located after second base frame in the display order "P4", in order to improve the image quality of one or more predicted frames in a video image compression as suggested by Demos (i.e. page 2, paragraph 0020 of Demos).

Regarding claim 33, Sharma teaches, an interpolation frame generation method for generating an interpolation frame (please see; fig. 1, device 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma) for interpolating image frames that are obtained by decoding a coded image signal (e.g. as illustrated in figs. 1 and 6 of Sharma, cols. 3 - 4, lines 66 – 22 and col. 5, lines 45 – 48; receiver 19, including frame rate up-sampler "FRU 20" integral with decoder "e.g. col. 4, lines 9" decodes the received coded image signal "e.g. fig. 1,

receiver 19, receives the coded image signal from encoder/sender 8 through communication channel 10" for interpolating the image frames by decoding the coded image signal, of Sharma) that is coded by motion compensation (please see; abstract, lines 9 – 13, col. 5, lines 25 – 27 and lines 35 – 37, indicating motion compensation taking place in encoder side to generate motion vector "MV" and transmits the motion vectors as part of the video bit-stream/signal to be used to generate interpolated frames of Sharma), the method comprising; acquiring image signal information of the coded image signal (please see; fig. 1, receiver 19 "e.g. image signal information acquisition unit" to acquire/receive image signal information of the coded image signal from the sender/encoder side "e.g. sender/encoder unit 8 of fig. 1" through communication channel 10 of Sharma); partially selecting at least an image block among the entire image blocks that form a base frame and detecting a motion vector of the partially selected image block between the base frame and a reference frame (please see; figs. 3 – 5, col. 5, lines 33 – 48, motion estimation and motion compensation for detecting motion vector on a per block basis "e.g., per block basis; consider as partially select image block among the entire image blocks, since each block among the entire image blocks is being selected for motion vector processing" to detect a motion vector of the partially selected image block between two frames, the base frame "e.g., current frame" and a reference frame "e.g., previous frame" of Sharma); generating the interpolation frame in accordance with the image signal information and the motion vector (please see; fig. 1, receiver 19 including frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" in accordance with image information and the detected motion vector

transmitted as part of the video signal, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma), and generating the interpolation frame for an image block, based upon a motion vector detected by using an image frame (please see; fig. 1, frame rate up-sampler (FRU 20) integral with decoder "e.g. col. 4, lines 9" to generate the interpolation frame "e.g. interpolated frames, as illustrated in fig. 6" col. 4, lines 16 - 19 and col. 5, lines 30 – 48, and 62 - 65 of Sharma).

Sharma is silent in regards to explicit of, that is not included in one image frame located sequentially after the interpolation frame in a display order, image frame that is located temporally further from the interpolation frame than the one image frame).

Demos '004 in the same field of interpolation (i.e., figs. 5 and 12, page 2, paragraph 0025 and page 11, paragraph 0163) teaches, interpolation frame for an image block using image frame that is located further away from the interpolation frame than the one image frame.

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the video frame interpolation in video decoding process of Sharma, in accordance with the teaching of Demos, to improve the interpolation of video compression/decompression frames, as suggested by Demos (i.e., page 1, paragraph 0002).

Regarding claim 38, the limitations claimed are substantially similar to claim 22 above; therefore the ground for rejecting claim 22 also applies here.

Regarding claim 40, the limitations claimed are substantially similar to claim 33 above; therefore the ground for rejecting claim 33 also applies here.

Regarding claim 45, Sharma '079 teaches, an interpolation frame generation

for generating an interpolation frame for interpolating image frames (please see; figs. 1 - 3 of Sharma, device 19 including frame rate up-sampler (FRU 20) integral with decoder “e.g. col. 4, lines 9” as illustrated in fig. 6 is used for generating an interpolation frame, col. 4, lines 16 - 19 and col. 5, lines 45 – 48 of Sharma). The step and process of generating an interpolation frame for interpolating image frames of Sharma are software/program implemented, which inherently calls for computer program product.

a motion vector detection step for detecting motion vectors by utilizing a plurality of first image frames (please see; figs. 2 – 5, col. 5, lines 33 – 60, detection of motion vector between plurality of first image frames “e.g. two successive frames of the sequence, previous and current frames” of Sharma); and

an interpolation frame generation step for generating the interpolation frame in accordance with the motion vectors (please see; fig. 1, frame rate up-sampler (FRU 20) integral with decoder “e.g. col. 4, lines 9” to generate the interpolation frame “e.g. interpolated frames, as illustrated in fig. 6” col. 4, lines 16 - 19 and col. 5, lines 45 – 48 in accordance with the encoded motion vectors, of Sharma).

Sharma ‘079 teaches detection of motion vector between two successive image frames (e.g., Previous frame and Current Frame as shown in figs. 2 – 5), which are before and after interpolated frame.

Although Sharma ‘079 teaches using successive image frames (i.e., previous frame and Current Frame as shown in figs. 2 – 5) located before and after interpolated frame, Sharma ‘079 is silent in regards to explicit of “<u>plurality of image frames</u> that are located either before or after the interpolation frame in the display order”.

However, Demos '004 in the same field teaches (please see; figs. 5 and 20 - 22, page 2, paragraphs 0025, 0030, page 4, paragraph 0051 and page 8, paragraphs 0120 – 0122) the use of plurality of image frames as a reference frames that are located before or after the interpolation frame in the display order (i.e., noted in Figs. 5 and 21, that the plurality of "P" frames are located before or after the interpolated "B" frame; see paragraphs 0005 and 0028).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the video frame interpolation process of Sharma, in accordance with the teaching of Demos by using plurality of image frames (i.e., P frames) as a reference frame which are located either before or after the interpolation frame (i.e., B frame) in the display order, in order to improve the image quality of one or more predicted frames in a video image compression as suggested by Demos (i.e. page 2, paragraph 0020 of Demos).

Regarding claims 47, 49 and 51, the combination of Sharma '079 and Demos '004 teaches, wherein the motion vector is detected for a reference frame that is in a same scene as a base frame (Sharma; col. 7, lines 58 – col. 8, lines 5 and 36-40).

Regarding claims 48, 50 and 52, the combination of Sharma '079 and Demos '004 teaches, smoothing filter (Sharma, col. 4, lines 60-col. 5, lines 5).

3. Claims 13 – 17, 36 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (US 5,204,740) in view of Demos (US 2004/0005004).

Regarding claim 13, Ishii '740 discloses, an interpolation frame generation device for generating an interpolation frame for interpolating image frames (please see; fig. 1, interpolation decision unit 24, adaptive interpolation circuits 26 and 27, col. 4, lines 19 –

35, indicating inter-frame interpolation and intra-frame interpolation), the device comprising:

generation process ability decision unit operable to decide generation process ability for generating the interpolation frame (please see; fig. 1, interpolation decision unit 24, adaptive interpolation circuits 26 and 27, col. 2, lines 21 – 24, col. 3, lines 18 – 29, indicating generation of interpolation frame based on the decision unit "e.g. ability" deciding if the image signal can be decoded or not, of Ishii); and

interpolation frame generation unit operable to generate the interpolation frame in accordance with a decision of the generation process ability decision unit (please see; fig. 1, interpolation decision unit 24, adaptive interpolation circuits 26 and 27, col. 2, lines 21 – 24, col. 3, lines 18 – 29 and col. 4, lines 19 - 35, indicating generation of interpolation frame based on the decision unit "e.g. ability" of Ishii).

Ishii is silent in regards to explicit of, that is not included in one image frame located sequentially after the interpolation frame in a display order, image frame that is located temporally further from the interpolation frame than the one image frame).

Demos '004 in the same field of interpolation (i.e., figs. 5 and 12, page 2, paragraph 0025 and page 11, paragraph 0163) teaches, interpolation frame for an image block using image frame that is located further away from the interpolation frame than the one image frame.

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the image decoding apparatus of Ishii, in accordance with the teaching of Demos, to improve the interpolation of video

compression/decompression frames, as suggested by Demos (i.e., page 1, paragraph 0002).

Regarding claim 14, the combination of Ishii and Demos teaches, the interpolation frame generation device (please see; fig. 1 of Ishii, interpolation decision unit 24, adaptive interpolation circuits 26 and 27, col. 4, lines 19 – 35, indicating inter-frame interpolation and intra-frame interpolation), wherein the interpolation frame generation unit is operable to change the number of interpolation frames in accordance with a decision of the generation process ability decision unit (please see; fig. 1 of Ishii, interpolation decision unit 24, adaptive interpolations 26 and 27, col. 3, lines 14 – 33 and col. 4, lines 19 – 35, where discloses the adaptive interpolation circuits 26 and 27 generates interpolation frame in accordance with a decision of the interpolation decision unit 24 and motion decision unit 20 and selects the inter-frame interpolation and/or intra-frame interpolation based on the decision, which changes the number of interpolation frames in accordance with the selected mode, of Ishii).

Regarding claim 15, the combination of Ishii and Demos teaches, the interpolation frame generation unit is operable to change the number of image blocks that form an imager frame in which the motion vectors are detected in accordance with a decision of the generation process ability decision unit (please see; Ishii, col. 3, lines 19 – 36, the selection of inter-frame and/or intra-frame interpolation for a block by adaptive interpolation circuit based on the interpolation decision circuit would change the number of image blocks that form an imager frame, of Ishii).

Regarding claims 16 – 17, the combination of Ishii and Demos teaches the claimed limitation, to change range (Demos, page 2, paragraph 0018 and pages 5 – 6, paragraphs 0078 – 0084).

Regarding claim 36, the limitations claimed are substantially similar to claim 13 above; therefore the ground for rejecting claim 13 also applies here.

Regarding claim 43, the limitations claimed are substantially similar to claim 13 above, and are computer implemented software/instruction to carry on the process of frame interpolation, since the disclosure of Ishii and Demos are computer implemented, therefore the software/instruction for performing the frame interpolation process would have been necessitated.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Behrooz Senfi whose telephone number is 571-272-7339. The examiner can normally be reached on M-F 7:00-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on 571-272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Behrooz Senfi/
Examiner
Art Unit 2621

/Tung Vo/

Primary Examiner, Art Unit 2621